available at the Crescent Junction disposal site. The resulting difference in percent increase in traffic is shown in Table 2–32. Because all other aspects of traffic impacts would be the same, the full analysis of traffic impacts is not repeated in this section.

4.3.17 Disposal Cell Failure from Natural Phenomena

It is possible that a disposal cell failure could occur at the Crescent Junction site. The possibility of failure at this site is much lower than at the Moab site because it was selected for analysis, in part, to avoid the more dynamic characteristics of the Moab site (see Chapter 3.0). The Crescent Junction site is not located near a river, does not have historical seismic activity, and is not prone to settling. In addition, this site is located farther away from populated areas or sensitive habitats than the Moab site, which would reduce the potential risks if a disposal cell failure occurred. Therefore, the possibility of a failure occurring and resulting in potential risks at the Crescent Junction site would be much lower than the potential risks of a disposal cell failure at the Moab site. For this reason, a potential failure at this site was not evaluated.

4.3.18 Environmental Justice

The basis for DOE's analysis of environmental justice impacts is described in Section 4.1.18. One census block area with a reported annual household income less than $18,244 (poverty level for a family of four) is found about 25 miles north of the Crescent Junction site. Although this population could be exposed to small doses of radiation as a result of activities under this alternative, there is no evidence that it would be exposed at a level any higher than the general population. Although traffic in central Moab would be an adverse impact, it does not appear that minority or low-income populations would suffer disproportionately.

DOE has identified no high and adverse impacts, and no minority or low-income populations would be disproportionately affected by the implementation of the Crescent Junction off-site disposal alternative.

4.4 Off-Site Disposal (White Mesa Mill Site)

This section discusses the short-term and long-term impacts associated with off-site disposal at the White Mesa Mill site, the third of the three off-site disposal alternatives. The White Mesa Mill site is located approximately 85 miles south of the Moab site. The impacts are based on the proposed actions described in Section 2.2 and the affected environment described in Sections 3.1 and 3.4. This alternative may result in the following impacts:

- Impacts at the Moab site
- Impacts at the White Mesa Mill site
- Impacts associated with moving tailings from the Moab site to the White Mesa Mill site

The combined impacts that could result from these activities are summarized for each assessment area (e.g., Geology and Soils) at the end of each subsection. For many activities, impacts at the Moab site would not differ significantly from those described in Section 4.2 for the Klondike Flats site. Likewise, construction and operation impacts at the White Mesa Mill site would be

similar to those addressed for the Klondike Flats and Crescent Junction sites, with the exception that the White Mesa Mill site is already an operating waste disposal facility.

Transportation impacts would vary depending upon the transportation mode (truck or slurry pipeline). Contaminated vicinity property material would be transported from the Moab site to the White Mesa Mill site along with the tailings. Therefore, impacts associated with transporting vicinity property materials are not addressed separately. Impacts associated with transporting borrow materials are addressed in Section 4.5.

4.4.1 Geology and Soils

4.4.1.1 Construction and Operations Impacts at the Moab Site

Under the White Mesa Mill off-site disposal alternative, the geology and soil impacts at the Moab site would be the same as those described in Section 4.2.1.1.

4.4.1.2 Construction and Operations Impacts at the White Mesa Mill Site

Geology

Impacts related to geology at the White Mesa Mill site would be similar to those described for the Klondike Flats site in Section 4.2.1.2, with some exceptions relating primarily to potential geologic hazards. Although the potential for an impact from a seismic event remains low, there is a potential for subsidence at the edges and slopes of the White Mesa Mill site and for landslides and slumps in the canyons bordering the site. These are not serious hazards and are only of significance over extremely long time frames (many thousands of years).

Soils

Impacts related to soils at the White Mesa Mill site would be similar to those described for the Klondike Flats site in Section 4.2.1.2 with the exception that the estimated maximum area of disturbed soils from construction of a new cell and a staging and support area would be 346 acres for either the truck or slurry pipeline mode of transportation.

4.4.1.3 Construction of Operations Impacts Related To Transportation

The truck and slurry pipeline transportation options would both result in disturbances to soils due to construction of temporary off-site transportation infrastructure elements and corridors between the Moab and White Mesa Mill sites. These would include highway exchanges or the pipeline right-of-way. Because much of the requisite truck transportation infrastructure already exists at the White Mesa Mill site, truck transportation would require only limited additional disturbances, approximately 2 acres. The pipeline right-of-way from the Moab site to the White Mesa Mill site would result in short-term disturbance to approximately 430 acres of soil.

4.4.1.4 Impacts from All Sources

Removal of the tailings pile from the Moab site could render underlying sand and gravel resources available for commercial exploitation should contaminant levels be sufficiently low to allow such uses. Geologic hazards near the White Mesa Mill site are not serious and could only affect the stability of the disposal cell over many thousands of years. Table 4–39 summarizes estimated areas of disturbed soils. Areas where soil would be disturbed and subsequently restored include the entire Moab site, areas of new construction at the White Mesa Mill site, and highway exchanges or the pipeline right-of-way.

Table 4–39. Summary of Impacts Related to Soil Disturbance—White Mesa Mill Site Off-Site Disposal Alternative

Soil Disturbance Location or Source	Area of Soil Disturbance (acres)
Moab site	439
White Mesa Mill site	
Truck transportation option	346
Slurry pipeline transportation option	346
Off-site transportation infrastructure or corridor	
Truck transportation infrastructure	2
Slurry pipeline right-of-way	430

4.4.2 Air Quality

Air quality impacts under the White Mesa Mill off-site disposal alternative would be very similar both qualitatively and quantitatively to those described for the Klondike Flats off-site disposal alternative in Section 4.2.2. As shown in Table 4–40 and Table 4–21, the concentrations of criteria air pollutants estimated to occur at the Moab site would be identical under both the White Mesa Mill and Klondike Flats off-site disposal alternatives. As shown in Table 4–41 (White Mesa Mill site) and Table 4–22 (Klondike Flats site), the estimated concentrations of carbon monoxide, nitrogen dioxide, and sulfur dioxide would be approximately 10 percent higher at the White Mesa Mill site than at the Klondike Flats site, and concentrations of PM_{10} would be approximately 8 percent lower at the White Mesa Mill site. The estimated concentrations from emissions shown in Table 4–40 and Table 4–41 were derived by applying tailpipe emission factors provided in *Compilation of Air Pollutant Emission Factors* (EPA 2000) to the estimated construction fleet composition and duration of construction operations. All emissions of criteria air pollutants would be well below the primary and secondary NAAQS in 40 CFR 50 under either the truck or pipeline transportation option.

4.4.3 Ground Water

Ground water impacts as a result of construction and operations at the Moab site and of monitoring and maintenance at the White Mesa Mill site would be comparable to those described in Section 4.2.3.1. Therefore, these concerns are not addressed further in this section.

No impacts as a result of monitoring and maintenance under the White Mesa Mill off-site disposal alternative would occur at the site. Therefore, these concerns are not discussed further in this section.

Table 4–40. Criteria Pollutant Concentrations at the Moab Site

Pollutant	Averaging Period	Standard (µg/m^3)	Concentration from Emissions (µg/m^3)
Carbon monoxide	1-hour	40,000	40
	8-hour	10,000	28
Nitrogen dioxide	Annual	100	9.1
Sulfur dioxide	Annual	80	0.90
	24-hour	365	4.5
	3-hour	1,300	10
PM_{10} [a]	Annual	50	3.2
	24-hour	150	16

[a]PM_{10} includes fugitive dust emissions from construction activities.
µg/m^3 = micrograms per cubic meter.

Table 4–41. Criteria Pollutant Concentrations at the White Mesa Mill Site

Pollutant	Averaging Period	Standard (µg/m^3)	Concentration from Emissions (µg/m^3)
Carbon monoxide	1-hour	40,000	59
	8-hour	10,000	41
Nitrogen dioxide	Annual	100	13
Sulfur dioxide	Annual	80	1.4
	24-hour	365	7.0
	3-hour	1,300	16
PM_{10}[a]	Annual	50	3.3
	24-hour	150	17

[a]PM_{10} includes fugitive dust emissions from construction activities.
µg/m^3 = micrograms per cubic meter.

4.4.3.1 Construction and Operations Impacts at the White Mesa Mill Site

The potential exists for adverse impacts to ground water quality at the White Mesa Mill site in the long term due to the shallow perched aquifer in the Burro Canyon Formation. This aquifer, located approximately 50 to 110 ft below land surface, already has milling-related contamination as a result of past operations at the White Mesa Mill, as documented by IUC and others. Any contaminants contributed by the Moab tailings would be in addition to existing contamination. Therefore, the potential would exist for an incremental increase in adverse effects to the shallow aquifer. However, the potential for Moab site tailings to add contamination to the shallow aquifer would be minimized by construction of a designed low-permeability cover on the disposal cell. The cover would minimize the infiltration and migration of constituents to ground water.

The potential also exists for migration of both existing and Moab site-contributed contaminants to reach springs and seeps downgradient of the White Mesa Mill site, which has been investigated by IUC (IUC 2003). The nearest discharge point located most directly downgradient from the tailings cells is Ruin Spring, approximately 10,000 ft south-southwest of the cells. The estimated travel time from the proposed disposal cell location to the perched ground water zone, and then to Ruin Spring, was calculated using assumptions of average porosity, average hydraulic gradient, and an average permeability range. The total estimated average travel time for contaminants contributed by the Moab tailings to reach Ruin Spring under current conditions is between 3,570 and 7,690 years. This assumes no dispersion and an average hydraulic gradient

of 0.012 ft/ft over the range of permeabilities used (IUC 2003). However, there is currently no evidence of contaminated ground water reaching Ruin Spring.

A deeper aquifer, the Entrada/Navajo, is located approximately 1,000 ft below the base of the Burro Canyon Formation. This is a confined aquifer that serves as a major regional ground water resource and would not be anticipated to be affected by the proposed disposal cell. However, the State of Utah Division of Radiation Control noted that there is evidence of contamination from the shallow aquifer reaching the deeper confined aquifer according to test results from IUC water supply well WW-2, which is completed in the deeper aquifer. No adverse impacts to sole-source aquifers would occur, as there are none in the area that would be affected by the proposed disposal cell.

The compliance strategy for ground water protection would be consistent with the UMTRCA Title II requirements already in place at the White Mesa Mill site and would depend on the current status of the site's NRC license. Compliance with ground water standards could involve implementation of ACLs if approved by NRC.

4.4.3.2 Construction and Operations Impacts Related to Transportation

Under the White Mesa Mill off-site disposal alternative, depth to ground water in the shallow (uppermost) aquifer varies along the proposed pipeline route from very shallow in the Matheson Wetlands Preserve area to approximately 100 ft below land surface in other areas. Truck transportation would not adversely affect ground water. Because of controls identified in Chapter 2.0 concerning installation and operation of a slurry pipeline, it is also unlikely that there would be any impacts to shallow ground water as a result of this transportation mode.

4.4.4 Surface Water

Under the White Mesa Mill off-site disposal alternative, construction and operations impacts at the Moab site would be similar to those described in Section 4.2.4.1. No impacts to surface water as a result of monitoring and maintenance are anticipated. Therefore, these activities are not discussed further in this section.

4.4.4.1 Construction and Operations Impacts at the White Mesa Mill Site

Construction at the White Mesa Mill site would have a potential short-term impact that could be caused by sediment runoff into adjacent surface waters. However, because of their locations, the stock watering ponds, wildlife pond, ephemeral catch and seepage basins, and intermittent flowing streams would likely not be affected.

Seeps and springs adjacent to the White Mesa Mill site could be affected in the long term by contaminated ground water, as described in Section 4.4.3.1. However, impacts would be considered minimal because of the cell cover design and time frame for ground water to reach these areas.

4.4.4.2 Construction and Operations Impacts Related to Transportation

Under the White Mesa Mill off-site disposal alternative, construction of a slurry pipeline would affect the Colorado River and an estimated 10 other perennial streams and 21 intermittent

drainages. An estimated 3,500 ft of directional drilling would be required for stream crossings, and up to 1 mile of open-cut buried crossings for other drainages. Therefore, the potential exists for short-term adverse impacts to surface water as a result of construction of a slurry pipeline in locations where surface waters exist. Such impacts would be associated with sedimentation and increased turbidity from siltation during construction. However, these impacts would be minimized or eliminated by site controls described in Chapter 2.0. No adverse impacts to surface water as a result of truck transportation of the tailings would be anticipated.

4.4.5 Floodplains/Wetlands

4.4.5.1 Construction and Operations Impacts at the Moab Site

Impacts to floodplains and wetlands at the Moab site would be identical to those described in Section 4.2.5.1.

4.4.5.2 Construction and Operations Impacts at the White Mesa Mill Site

There would be no impact from flooding at the White Mesa Mill site because this site is located beyond the potential floodplains of nearby streams. There could be short-term impacts to potential wetland and riparian areas in these streams from increased runoff during disposal cell excavation. Additional potential impacts to wetlands at the White Mesa Mill site are unknown because a detailed assessment of wetlands has not been done.

4.4.5.3 Construction and Operations Impacts Related to Transportation

At the Moab site, the slurry pipeline option would affect the Colorado River floodplain and Matheson Wetlands Preserve during construction. Construction of the pipeline could also involve drilling under other floodplain and wetland areas along the proposed route to the White Mesa Mill site. These areas would be identified and potential impacts more fully assessed prior to completion of the RAP.

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4.4.5.4 Impacts from All Sources

Impacts from all sources would be the same as those described in Section 4.2.5.3. In addition, there would be the potential for short-term impacts to nearby wetlands and floodplains from runoff during disposal cell excavation. There would be the potential for adverse impacts to wetlands and floodplains if the pipeline transportation mode were implemented.

4.4.6 Aquatic Ecology

No monitoring or maintenance impacts to aquatic ecology would be anticipated under the White Mesa Mill off-site disposal alternative. Therefore, these activities are not discussed further in this section.

4.4.6.1 Construction and Operations Impacts at the Moab Site

Under all of the off-site disposal alternatives, the impacts to aquatic biota and habitats at the Moab site would be very similar to those described for on-site disposal (Section 4.1.6.1). It is assumed that the same amount of physical disturbance would occur at the Moab site regardless of the disposal option. Off-site disposal would probably decrease the potential for runoff and siltation at the Moab site. Chemical and radiological impacts to aquatic resources would be

similar to those described for the on-site disposal alternative. The annual use of 235 to 730 acre-feet (depending on transportation mode) of nonpotable Colorado River water would be within DOE's authorized river water use rights. (Some of the projected potable water demand would be met using IUC's Recapture Reservoir rights). If Colorado River water use exceeded the 100 acre-foot annual limit set by USF&WS as protective, the unavoidable impact would be mitigated through negotiated water depletion payments.

4.4.6.2 Construction and Operations Impacts at the White Mesa Mill Site

There are no surface waters with sustainable aquatic species near locations where construction and operation activities would occur at the White Mesa Mill site; therefore, no physical, chemical, or radiological adverse impacts to aquatic receptors would occur.

4.4.6.3 Construction and Operations Impacts Related to Transportation

The impacts to aquatic biota and habitat from transporting the Moab tailings to the White Mesa Mill site would depend on the transportation option selected. Surface waters along the transportation corridors to White Mesa Mill are discussed in Chapter 3.0. Aquatic receptors, including benthic macroinvertebrates, could be adversely affected by sedimentation of stream crossings during slurry pipeline construction. Although fish would most likely avoid the turbid area, spawning substrate and stream invertebrates could be adversely affected in the short term. Impacts to aquatic resources could also occur as a result of a truck transportation spill or pipeline breach into aquatic environments along the transportation routes. Impacts from spills would depend on the amount of material released and the ability to retrieve the material before contaminants dissolved into the aquatic environment. However, project controls would ensure that minimal or no impacts would be expected.

4.4.6.4 Impacts from All Sources

Overall potential impacts to aquatic ecology would include impacts from slurry pipeline construction activities in surface waters, including the Colorado River adjacent to the Moab site. Impacts to surface waters could also occur as a result of truck spills. However, because of the volume of materials, the short duration, and site controls, the potential for these impacts would be minimal.

4.4.7 Terrestrial Ecology

4.4.7.1 Construction and Operations Impacts at the Moab Site

Under all the off-site disposal alternatives, impacts to terrestrial biota and habitats at the Moab site would be very similar to those described for on-site disposal (Section 4.1.7.1). It is assumed that the same amount of physical disturbance would occur at the Moab site regardless of the disposal option. Noise levels would probably be comparable under both the on-site and off-site disposal alternatives, because roughly the same numbers and types of equipment would be required. Off-site disposal would probably decrease the potential for runoff and sedimentation at the Moab site. Chemical and radiological impacts to terrestrial resources would be similar to those described under the on-site disposal alternative. Appendix A1, "Biological Assessment," discusses potential effects to federally listed species at this site in more detail.

4.4.7.2 Construction and Operations Impacts at the White Mesa Mill Site

Under the White Mesa Mill off-site disposal alternative, development of a disposal cell and support facilities would disturb approximately 346 acres in the disposal cell area. The effects of physical disturbance would include the loss of foraging and breeding habitat. Wildlife species known to use the White Mesa Mill site include mule deer, which migrate through the area and browse it fairly heavily. Many other wildlife species are known to occur in the site vicinity (Section 3.4.9).

The southwestern willow flycatcher and black-footed ferret are the only federally listed species that could potentially be affected by habitat disturbance resulting from construction of a disposal cell. There was a reported flycatcher sighting in San Juan County in the vicinity of the slurry pipeline corridor (UDWR 2003). However, there is no information on the date of the reported sighting or on whether the sighting was confirmed. There is no suitable habitat for flycatchers known to occur on the White Mesa Mill site. Consequently, impacts to this species from disposal cell construction would not be anticipated.

UDWR (2003) reported a confirmed ferret sighting in the vicinity of the White Mesa Mill disposal site in 1937. However, all black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne counties in 1999 or their offspring could occur on or in the vicinity of the White Mesa Mill site. Black-footed ferrets depend almost exclusively on prairie dog colonies for food, shelter, and denning. Although the area from Moab south along US-191 toward the White Mesa Mill site supports colonies of Gunnison's prairie dog (*Cynomys gunnisoni*) (Seglund 2004), no colonies are currently known to occur at or close to the White Mesa Mill site. Consequently, impacts from construction to the black-footed ferret would not be anticipated.

Impacts of physical disturbance could be avoided or minimized in several ways. The most important action would be to conduct field surveys prior to any site development activities to determine the presence of any species of concern. Additional actions would include minimizing site disturbance to the extent practicable, revegetating disturbed lands and the cover cap once it was completed, and scheduling ground-clearing activities during periods that would not disturb nesting migratory birds.

Noise due to construction and operations could have an adverse effect on terrestrial wildlife. At the White Mesa Mill site, noise would be generated by construction equipment and material transfer operations. The estimated maximum noise levels that would be generated when all equipment was operating would be approximately 95 dBA at 49 ft. The noise level would attenuate over a distance of approximately 6 miles until it reached the quiet desert background level of approximately 30 dBA. However, the White Mesa Mill is an active uranium milling site, which has a relatively high background noise level when operating. Therefore, much of the wildlife currently at or near the White Mesa Mill site is probably already habituated to human presence and noise.

Noise can affect terrestrial organisms by causing physiological changes and behavioral modifications, including nest abandonment. It can also disrupt communication and defense systems. Any of the species that may be present at the White Mesa site could be affected by the noise associated with construction and operations.

The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas. The bald eagle is the only federally listed species in the vicinity of the White Mesa Mill site that could be affected by noise from site operations. However, it is not known to nest or night roost in the area, nor is it commonly seen in the area, and it would therefore be unlikely to be affected.

Other effects of human presence, including night lighting, also would reduce the overall habitat value of the area. As with noise, some species become habituated to human presence, but others such as deer or pronghorn antelope could avoid the site during human activities. The White Mesa Mill site is surrounded by many square miles of similar or better habitat. Therefore, individuals that avoided the area because of construction activities would not be forced into less desirable habitat.

The effects of noise, supplemental lighting, and human presence could be greater at night than during the day. Therefore, double-shift operations would likely have a greater impact than single-shift operations. The effects of noise, supplemental lighting, and human presence could be mitigated by limiting the amount of light off the site, minimizing activities at the periphery of the site, and limiting especially loud activities to daylight hours and to seasons when the effects on biota would be reduced.

There would not likely be chemical impacts at the White Mesa Mill site. Accidental spills of diesel, oil, or other materials would be quickly controlled and mitigated.

4.4.7.3 Impacts of Transportation

The effects of transporting the Moab tailings to the White Mesa Mill site would depend on the transportation option selected. Truck transport would increase collision mortality and highway noise, but a slurry pipeline could disrupt more habitat along the pipeline corridor. Borrow materials would be transported to the White Mesa Mill by truck, regardless of the selected mode of tailings transport.

Truck Transportation Option

Truck transportation of tailings from the Moab site to the White Mesa Mill site would increase the amount of truck traffic on US-191 south of Moab (Section 4.4.16). This increase in traffic would likely lead to an increase in traffic-related wildlife mortalities and an increase in the average noise levels in the vicinity of the highway.

The highway route between Moab and White Mesa Mill crosses important migration routes for mule deer and critical range for pronghorn antelope. At least during periods of migration, the increase in truck traffic could lead to an increase in mortality of these species.

The bald eagle is the only federally listed species that could incur an increase in traffic-related mortality. The Gunnison sage grouse is the only federal candidate species that could be so affected. The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas. Bald eagles could be found temporarily and infrequently using such areas when there are opportunities to feed on carrion, such as in big-game wintering areas or in prairie dog colonies. Therefore, it is possible that if traffic-related wildlife mortality increased due to the project, an increased number of eagles could be hit on highways. However, without data on this relationship, it is reasonable to assume

that the number of eagles hit on highways would be proportional to the number of carrion available. The increase in the number of traffic-related wildlife mortalities is expected to be small. Consequently, the potential increase in associated eagle deaths is also expected be small.

The Gunnison sage grouse was observed in 1999 in San Juan County in the vicinity of the proposed slurry pipeline corridor between Moab and the White Mesa Mill site. Much of the area near the proposed pipeline route between Moab and White Mesa is part of a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000). The increased truck traffic could increase traffic-related mortality for this species.

As described in Section 4.4.10, the increased truck traffic along US-191 resulting from transport of tailings from the Moab site to the White Mesa Mill site would likely increase ambient noise levels by approximately 5 dB (measured at 49 ft). Although the highway noise (average baseline approximately 70 dBA) could be detected by humans over distances of 6 to 7 miles, the additional noise due to the additional trucks would not be perceptible beyond several hundred yards.

The primary federally listed species that could be affected by this increased traffic noise would be the Mexican spotted owl. Designated critical habitat for the spotted owl occurs within 2 miles of the transportation corridor just south (within 25 miles) of the Moab site. However, data provided by UDWR (2003) indicated that there were no occurrences of the Mexican spotted owl in any of the project areas. Thus, it is possible but unlikely that spotted owls occur in this area. If present, the species could potentially be disturbed by noise from increased truck traffic, although the probability of such a disturbance, based on the incremental increase in highway noise, would be minimal.

The potential for impacts to terrestrial wildlife from truck transportation of tailings would be greater in the evening or at night than during the day. Therefore, the impacts of two-shift operations would probably be greater than those of single-shift operations. In either case, the impacts would be of relatively short duration and would cease once the transfer of materials to the disposal cell was completed.

Slurry Pipeline Option

Use of a slurry pipeline system to transport tailings from the Moab site to the White Mesa Mill site would increase the amount of habitat disturbance along the transportation corridor.

Most of the slurry pipeline route to the White Mesa Mill site is parallel and adjacent to either US-191or existing gas pipeline rights-of-way. However, approximately 28.7 miles of new right-of-way would be required along this route. Construction of the pipeline within existing corridors would not likely have an adverse ecological impact other than disturbance of revegetated previously disturbed areas. Construction within new rights-of-way would affect a greater variety of habitats.

Wetland areas could be inhabited by Utah state-listed plant species of concern. Animal species that could be affected include the black-footed ferret, Mexican spotted owl, southwestern willow flycatcher, and Gunnison sage grouse, as well as numerous animal species listed by Utah as species of concern. Black-footed ferrets have been observed at five locations in the region between the Moab site and the north IUC borrow area (UDWR 2003). However, it is unlikely

that ferrets are present along the route of the proposed pipeline, based on the rationale provided in the discussion of the black-footed ferret in Section 4.4.7.2.

Mexican spotted owls are not likely to occur near the proposed slurry pipeline route because the route would not cross through or near any steep-walled canyons that are preferred nesting areas (USF&WS 1995 and 2001). Southwestern willow flycatchers are not likely to occur in the area because the proposed route crosses very little wooded-riparian habitat. Gunnison sage grouse could be affected, since much of the area near the proposed pipeline route between Moab and White Mesa is part of a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000). A thorough survey of the pipeline right-of-way would be performed prior to construction, and appropriate mitigation plans would be developed if any of these species were identified within the right-of-way.

In addition to field surveys to identify populations of these species of concern, mitigation could consist of adjusting the pipeline location if needed and constructing the pipeline during periods of the year that would not disrupt the breeding or nesting of Gunnison sage grouse, spotted owls, willow flycatchers, or migratory birds. Operation of the pipeline would not be expected to have any adverse effects on wildlife species or habitats.

4.4.7.4 Monitoring and Maintenance Impacts

Routine post-closure monitoring and maintenance of a disposal cell at the White Mesa Mill site would not be expected to have any impacts on terrestrial species or habitats. If major corrective actions were needed, some of the recovering vegetation on and around the disposal site could be disturbed.

4.4.7.5 Impacts from All Sources

Overall impacts to terrestrial ecological resources under the White Mesa Mill off-site disposal alternative would include approximately 50 acres of tamarisk habitat lost at the Moab site (the rest of the site is considered to have zero habitat quality). A maximum of approximately 174 acres would be disturbed at borrow areas, approximately 90 percent of which would be for Moab site reclamation soil assumed to be obtained at the Floy Wash borrow area (White Mesa Mill disposal cell cover soils would be obtained from cell excavation material). Disturbances for disposal cell and borrow material excavation would include approximately 96 acres of disturbed piñon-juniper, scrub, or forested habitat. Approximately 346 acres would be disturbed for disposal cell construction.

The truck transportation option would require only 2 acres of disturbance for infrastructure construction. Total disturbance from all activities (Moab site, borrow areas, transportation, and White Mesa Mill site) from truck transportation would be approximately 570 acres. The slurry pipeline option would require 430 acres of disturbance for the pipeline corridor for a total of approximately 1,000 acres disturbance from all activities. Additional habitat could be lost at the commercial quarry sites for sand and gravel.

There would be a slight decrease in habitat value near US-191 because of the increased truck traffic required to haul tailings if the truck transport option were selected, and there would be a slight increase in traffic-related wildlife mortalities. Impacts of borrow material haulage would be less than those under the on-site disposal alternative because the radon barrier and cover

materials would be available near the disposal cell site, and haulage of these materials at highway speeds on US-191 would not be required.

4.4.8 Land Use

4.4.8.1 Construction and Operations Impacts at the Moab Site

Under the White Mesa Mill off-site disposal alternative, the land use impacts at the Moab site would be the same as those described in Section 4.2.8.1 for the Klondike Flats disposal alternative.

4.4.8.2 Construction and Operations Impacts at the White Mesa Mill Site

No impacts that are not part of IUC's existing operating plan would occur from construction and operations on IUC's property at the White Mesa Mill site. In addition, there would be no land use impacts from borrow materials secured from commercial operations. There would be short-term impacts from borrow areas permitted on BLM lands. Obtaining borrow material from areas on BLM lands would create only short-term impacts because these areas would be reclaimed and returned to BLM for prior designated uses. Disposal of tailings from the Moab site would commit 346 additional acres to permanent waste disposal.

4.4.8.3 Construction and Operations Impacts Related to Transportation

The truck haul transportation mode would require an additional 2 acres of disturbance to build an overpass over US-191 and to build additional acceleration and deceleration lanes to the existing highway at the site entrance. It is likely these would be built in the existing right-of-way and would create no additional land use impacts. A slurry pipeline would be built in the existing pipeline right-of-way for most of the distance, but would require an additional 28.7 miles of new right-of-way.

4.4.8.4 Monitoring and Maintenance Impacts

There would be no additional impacts from monitoring and maintenance at the site. If other monitoring locations were required outside IUC's property, wells or other monitoring equipment and the associated access would be negotiated and maintained.

4.4.8.5 Impacts from All Sources

Under the White Mesa Mill off-site disposal alternative, the primary long- and short-term land use impacts would occur from the activities at the Moab site, as described in Section 4.2.8.1. In addition, there could be short-term impacts from securing borrow materials from any borrow area on BLM property.

4.4.9 Cultural Resources

This section addresses the potential for the disturbance of known cultural resources or the discovery of unknown resources under the White Mesa Mill off-site disposal alternative.

4.4.9.1 Construction and Operations Impacts at the Moab Site

Impacts to cultural resources at the Moab site under the White Mesa Mill off-site disposal alternative would be the same as those described in Section 4.1.9.1.

4.4.9.2 Construction and Operations at the White Mesa Mill Site

On the basis of previous cultural surveys, 9 to 12 cultural sites eligible for inclusion in the National Register of Historic Places would be directly affected by construction of a disposal cell at the White Mesa Mill site. Table 4–42 lists the identification number, type, cultural affiliation of the 12 cultural sites, and recommendations made by the author of the Class I cultural resource inventory (Davis et al. 2003) for further cultural work. A minimum of five potential traditional cultural properties also could be adversely affected by disposal cell construction.

Table 4–42. Cultural Sites That May Be Adversely Affected by Disposal Cell Construction at the White Mesa Mill Site

Site Identification Number	Site Type	Cultural Affiliation	Recommendation for Further Work
42SA 6392	Limited activity	Unknown	Resurvey; update site form
42SA 6393	Limited activity	Basketmaker III to Pueblo II	Resurvey; update site form
42SA 6397	Limited activity	Early Pueblo II	Resurvey; update site form
42SA 6398	Limited activity	Basketmaker III to Pueblo I	Resurvey; update site form
42SA 6399	Habitation	Pueblo I to Pueblo II	Resurvey; update site form
42SA 6400	Limited activity	Basketmaker III to Pueblo I	Resurvey; update site form
42SA 6401	Limited activity	Basketmaker III	Resurvey; update site form
42SA 6429	Habitation	Pueblo II	Resurvey; update site form
42SA 6430	Habitation	Pueblo II	Resurvey; update site form
42SA 6431	Limited activity	Pueblo II	Resurvey; update site form
42SA 6433	Habitation	Pueblo III	Resurvey; update site form
42SA 13964	Temporary camp	Historical	Resurvey; update site form

Before construction of the disposal cell began, DOE, the State Historic Preservation Officer, affected Native American tribes, and the Advisory Council on Historic Preservation would determine appropriate mitigation measures for these sites through the Section 106 consultation process (Section 3.1.13.3). The archaeological sites would likely be excavated by professional archaeologists, and cultural resource data would be recovered and recorded. Given the archaeological discoveries made elsewhere on the White Mesa Mill facility (Casjens 1980), it is probable that additional archaeological structures, features, and objects would be unearthed during excavating. Mitigation of the potential traditional cultural properties, which may include sacred gathering areas, sacred healing areas, sacred springs, and burial areas, would be extremely difficult given the density and variety of these resources, the importance attached to them by tribal members, and the number of tribal entities that would be involved in consultations.

4.4.9.3 Construction and Operations Impacts Related to Transportation

Under the trucking option, one cultural site—the historic US-160 that parallels US-191—would be adversely affected by construction of the deceleration lane at the Moab site. Up to three

cultural sites could be adversely affected by haul road construction (depending on the final location of the road) at the White Mesa Mill site. Table 4–43 lists the identification number, type, cultural affiliation of the three cultural sites, and recommendations made by the author of the Class I cultural resource inventory (Davis et al. 2003) for further cultural work.

Table 4–43. Cultural Sites That Could Be Adversely Affected by Haul Road Construction at the White Mesa Mill Site

Site Identification Number	Site Type	Cultural Affiliation	Recommendation for Further Work
42SA 6402	Limited activity	Pueblo III	Resurvey; update site form
42SA 7750	Limited activity	Basketmaker III to Pueblo II	Resurvey; update site form
42SA 7753	Limited activity	Basketmaker III to Pueblo I	Resurvey; update site form

A total of 104 cultural sites eligible for inclusion in the National Register of Historic Places are known to exist within 0.5 mile of the proposed slurry pipeline route to the White Mesa Mill site. An additional 90 to 300 sites are estimated to occur in the unsurveyed portions of the pipeline. Of the 194 to 404 total, 50 to 100 could be adversely affected during pipeline construction. The one potential traditional cultural property known to exist along the pipeline route also would be adversely affected. Consequently, DOE estimates that at least 51 to 101 cultural sites could be adversely affected by the pipeline. If additional traditional cultural properties were located along the route (the potential for their occurrence is extremely high), they also would likely be adversely affected.

DOE, BLM, UDOT, the State Historic Preservation Officer, affected Native American tribes, and the Advisory Council on Historic Preservation would determine appropriate mitigation measures for these sites through the Section 106 consultation process (see Section 3.1.13.3). Mitigation measures could include (1) avoiding the sites, (2) monitoring the cultural resource during surface-disturbing activities, (3) excavating and recording cultural resource data before construction activities began, or (4) moving the cultural resource objects from areas of disturbance to nearby undisturbed areas. Given the likely density and variety of potential traditional cultural properties located along the route, the importance attached to them by tribal members, and the number of tribal entities that would be involved in consultations, mitigation of these sites would be extremely difficult.

In addition to these direct impacts, cultural resources located near the pipeline could be adversely affected indirectly through illicit collection, vandalism, or inadvertent destruction as a result of increased human activity in the area.

4.4.9.4 Monitoring and Maintenance Impacts

Under the White Mesa Mill off-site disposal alternative, impacts to cultural resources would not occur from monitoring and maintenance activities.

4.4.9.5 Impacts from All Sources

Table 4–44 lists the total number of cultural sites eligible for inclusion in the National Register of Historic Places that could be adversely affected under each of the White Mesa Mill site transportation alternatives.

Table 4–44. Number of Cultural Sites That Could Be Adversely Affected Under the Two White Mesa Mill Site Transportation Options

Location/Activity	Transportation Mode	
	Truck	Slurry Pipeline
Moab site (construction and operations)	0–2	0–2
Moab site (highway improvements)	1	0
White Mesa Mill site haul road construction	0–3	0–3
White Mesa Mill disposal cell area	14–17	14–17
Radon barrier borrow area (White Mesa Mill borrow area)	6	6
Riprap borrow area (Blanding borrow area)	3	3
Pipeline construction	NA	51–101[a]
Total	**24–32**	**74–130[a]**

[a]Numbers do not include potential traditional cultural properties that have not yet been identified along the pipeline route; the likelihood of their occurrence is extremely high.

4.4.10 Noise and Vibration

This section addresses the impacts of noise and ground vibration under the White Mesa Mill off-site disposal alternative, primarily to human receptors. Where appropriate, impacts to wildlife and cultural resources are also identified. Unless indicated otherwise, all noise and vibration impacts would be temporary and would last only as long as project construction and operations were ongoing.

4.4.10.1 Construction and Operations Impacts at the Moab Site

Noise from the Moab site under the White Mesa Mill off-site disposal alternative would come from construction activities and removal of the tailings pile. The largest sources of noise on the site would be heavy earth-moving equipment. Noise generated from these activities would not differ significantly from the noise generated at the Moab site under the on-site disposal alternative. Section 4.1.10 describes the noise associated with construction and earth-moving activities.

Ground vibration generated by heavy equipment at the Moab site is discussed in Section 4.1.10. No appreciable differences would be expected in ground-level vibration at the Moab site between the on-site disposal alternative and the White Mesa Mill off-site disposal alternative.

4.4.10.2 Construction and Operations Impacts at the White Mesa Mill Site

Noise at the White Mesa Mill site from the disposal of tailings would come from construction activities and hauling the tailings. The type of noise generated from these activities is described in Section 4.2.10.2 for the Klondike Flats site. No appreciable differences would be expected in the source or levels of noise. However, the receptors around the White Mesa Mill site would be

different from those around the Klondike Flats site. No residences are within the estimated 1,480-ft region of influence around the White Mesa Mill site.

Ground vibration generated from construction and operations at the White Mesa Mill site would be the same as those discussed in Section 4.2.10.2. There are no receptors at the White Mesa Mill site within the 820 ft estimated for ground vibration to attenuate to background levels. There are no sites of cultural importance that would be affected by ground vibration at the White Mesa Mill site.

4.4.10.3 Construction and Operations Impacts Related to Transportation

Transportation options for disposal at the White Mesa Mill site are truck and slurry pipeline. Truck traffic noise would be from traffic on US-191; the slurry pipeline noise would follow the pipeline route and would persist only during construction of the slurry pipeline. Trucks transporting the tailings would pass through four communities: Moab, La Sal Junction, Monticello, and Blanding. The increase in noise in each of these communities and around the highway sections between the cities would vary according to traffic levels (Table 4–45). Through Moab, due to the low truck speed, the noise levels would be expected to exceed 65 dBA only out to 82 ft from the road. US-191 passes through some residential areas within the City of Moab, so some residential buildings could be exposed to noise levels above the Moab residential standard of 65 dBA (Moab City Ordinance 17.74.080, "Noise Levels"). South of the Moab city limits, speed limits increase, and the region of influence would increase accordingly. For this area, the region estimated to exceed 65 dBA is 422 ft from the highway. It is likely that residents live within this region of influence. In the other communities between the Moab site and White Mesa Mill, some residential structures are likely to be within the 360-ft region of influence estimated for highway sections south of La Sal Junction, at Monticello, and at Blanding.

Table 4–45. Noise Impacts Around Transportation Routes for the White Mesa Mill Off-Site Disposal Alternative

Highway Section	Hourly Average Baseline Noise (dBA) at 25 ft From Source	Hourly Average Project Truck Traffic	Hourly Average Project Truck Traffic Noise (dBA) at 25 ft From Source	Total Noise (dBA) at 25 ft From Source	Region of Influence (ft)	Increase at 25 ft (dBA) From Truck Hauling Activities
Moab[a]	66	40	68	70	82	4.1
La Sal Junction through Moab	73	40	75	77	422	4.1
White Mesa to La Sal Junction	71	40	75	76	360	5.4

Assumptions:
Single project truck vehicle noise 95 dBA[b] at 60 mph[a], 25 ft from source.
Single project truck vehicle noise 85 dBA[b] at 60 mph[a], 25 ft from source.
[a]Project truck speed 30 mph within Moab city limits, 60 mph everywhere else.
[b]Conservative estimation based on values from multiple sources (Bowlby 1991, Sandberg 2001).

Noise emissions from construction of a slurry pipeline are described in Section 4.2.10.3. A 1,480-ft region of influence is estimated around the slurry pipeline route. The proposed routes for the slurry pipeline between the Moab site and the White Mesa Mill site would generally avoid communities. Few if any receptors would likely reside within 1,480 ft of the pipeline route. Construction of a slurry pipeline would likely result in ground vibration above background levels. The estimated maximum level for ground vibrations emitted by construction of a slurry pipeline would be 95 dBV. This level would result in ground vibration above background levels 820 ft from the source and levels above human perception within 330 ft of the source. Some

cultural sites containing rock granaries and a historic homestead lie within 2,620 ft of the pipeline, but ground vibration levels at these resources would not reach levels (estimated at 92 to 100 dBV) that would damage these structures.

4.4.10.4 Monitoring and Maintenance Impacts

Monitoring and maintenance of the White Mesa Mill site would not be expected to result in significant generation of noise. Any noise generated by these activities would attenuate to near background levels before leaving the boundary of the disposal site.

4.4.10.5 Impacts from All Sources

Noise generated by the White Mesa Mill truck haul option would exceed the Moab residential noise standard of 65 dBA at some receptor locations. The receptors with the most potential to notice any increase in noise generated by this alternative would include residents living near US-191 in and around Moab, the resident located on the eastern boundary of the Moab site, and residents of communities between Moab and the White Mesa Mill. If two 10-hour shifts were used instead of a single 12-hour shift, the noise generated would not change substantially, but there could be a higher potential for annoyance from late-night and early-morning activities.

4.4.11 Visual Resources

This section describes the impacts to those physical features of the landscape that impart scenic value in the region affected by the White Mesa Mill off-site disposal alternative. The impacts would be imposed on viewers who live in, work in, or visit an area and could see ongoing human activities or the results of those activities.

4.4.11.1 Construction and Operations Impacts at the Moab Site

Under the White Mesa Mill off-site disposal alternative, impacts to visual resources at the Moab site would be the same as those described in Section 4.2.11.1.

4.4.11.2 Construction and Operations at the White Mesa Mill Site

Construction and operations at the White Mesa Mill site would have minor adverse effects on visual resources, primarily because construction activities and the completed disposal cell would not be seen by most people. DOE selected four key observation points from which to assess visual impacts: (1) US-191 southbound, (2) US-191 northbound, (3) the nearest residence, and (4) the White Mesa Ute community. Figure 4–18 shows DOE's visibility analysis results for the proposed disposal cell location. The darkened areas indicate locations from which a disposal cell could potentially be viewed. The visibility analysis used to create this map is based on elevation and topography and does not take into account the potential obstruction of views from cultural modifications or vegetation or the effects of distance on visibility. Without visual aids, such as binoculars, most people would not be able to recognize a disposal cell at distances greater than 5 to 10 miles.

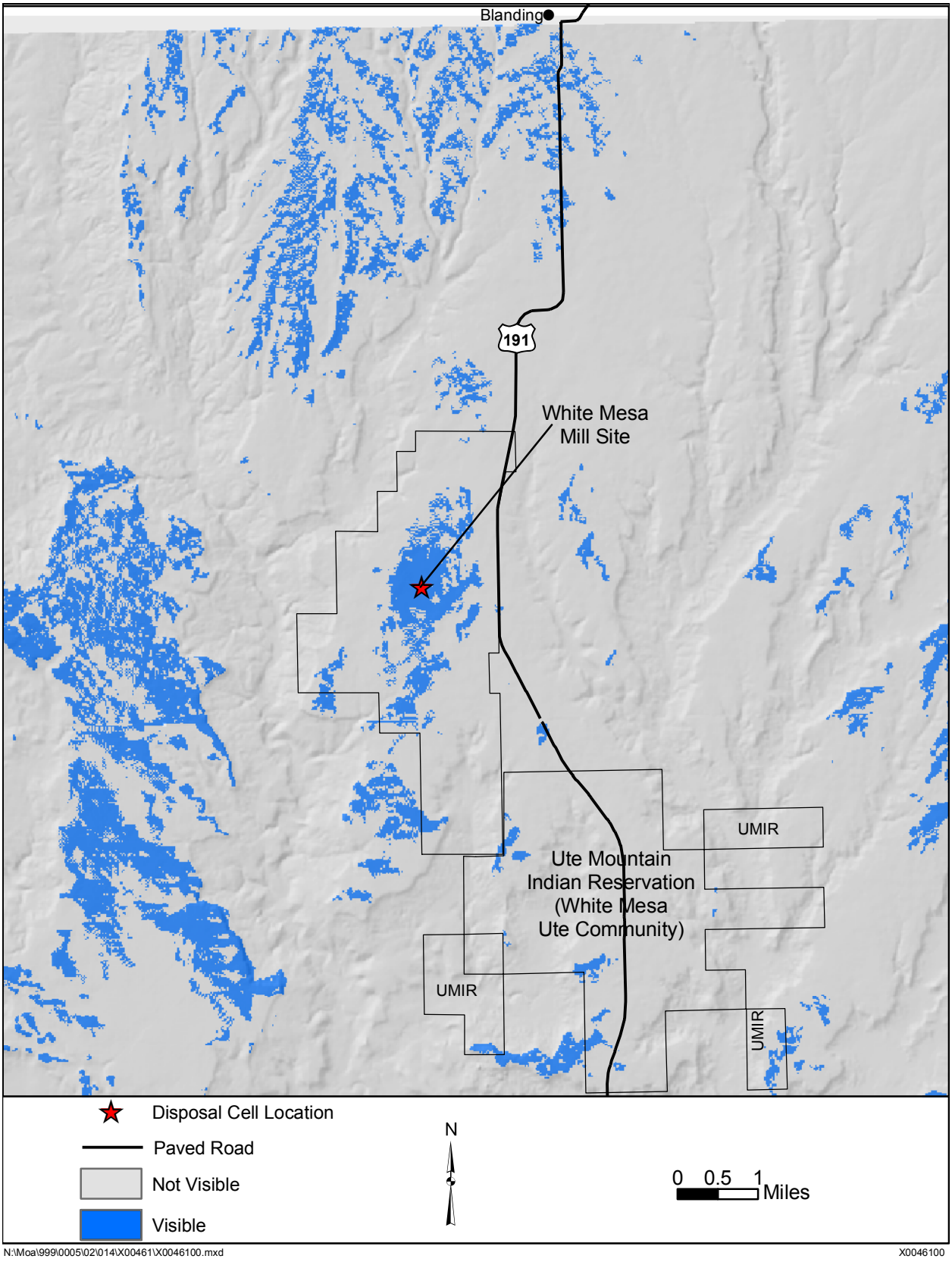

Figure 4–18. White Mesa Mill Site Visibility Analysis Map

The visibility analysis results indicate that travelers on US-191 would not likely see a cell. In Figure 4–18, small darkened areas are present at two locations along the highway within 5 miles of the site. Given the speed of travel, angle of view, and distance from the site, travelers would more likely notice the existing structures and topsoil salvage piles on the site than a more distant, lower-profile disposal cell. The view of DOE's disposal cell from the nearest residence, located approximately 1.6 miles north of the site's entrance road, would be obstructed by the structures and disposal cells currently located at the site. Because of distance, a disposal cell would not likely be visible from any locations within the White Mesa Ute community. The one potential adverse impact from cell construction at these key observation points would be from the lighting used during dawn and dusk hours (and at nighttime under the double-shift work scenario) during the construction period. Because the White Mesa Mill is a commercial facility, it is not known if night lighting would continue in the long term.

The activities proposed under this alternative would be compatible with BLM's Class III visual resource objectives for the area surrounding the site (BLM 2003). Although DOE is not required to meet the objectives of BLM's visual resource management system on the privately owned White Mesa Mill site, the system provides a useful way to measure the effects of a proposed action on visual resources.

4.4.11.3 Construction and Operations Impacts Related to Transportation

Truck Haul

Under the White Mesa Mill off-site disposal alternative, impacts to visual resources would not occur under the truck haul transportation option.

Slurry Pipeline

Approximately 25 percent of the pipeline corridor would be visible to the general public, mainly to Moab residents and travelers on US-191. DOE selected three key observation points from which to assess visual impacts: (1) US-191 at Kane Springs Canyon, (2) US-191 at the booster pump station in Lisbon Valley, and (3) US-191 at Recapture Creek. The Kane Springs Canyon and Recapture Creek areas have Class II visual resource designations, and the booster pump station in Lisbon Valley has a Class III designation.

From the Kane Springs Canyon key observation point, northbound travelers on US-191 would have a 20-second view of the pipeline corridor's cut through the massive, prominent Entrada Sandstone outcrop located west of the highway (see Figure 3–44). Southbound travelers would not see the cut. The trench-like, vertical cut would contrast strongly with the smooth, horizontal lines created by the Entrada Sandstone. Although the viewing time would be relatively short, the strong contrast in line and form created by the cut would likely draw the attention of some travelers. Construction of a slurry pipeline at this location would not meet the area's Class II visual resource objectives in the short term or long term, as the cut would be a permanent feature.

Northbound travelers on US-191 would have a 10- to 15-second view of the proposed booster pump station in Lisbon Valley. The view of the station by southbound travelers would be obstructed by a large rock outcrop. The simple, angular, geometric form of the pump station, with its smooth surfaces, and the associated barren parking area would contrast strongly with the more complex, semi-rugged, vegetated surroundings. Figure 4–19 shows a photo simulation of the proposed pump station and newly constructed pipeline. Because the size of the station would be relatively small against the massive, prominent rock outcrops and cliff faces in the background, the overall contrast would be weak for most travelers. The proposed action would meet the area's Class III visual resource objectives.

Figure 4–19. Simulated View of the Booster Pump Station in Lisbon Valley and Newly Constructed Pipeline from Northbound Lane of US-191

Across Recapture Creek canyon, the pipeline corridor would parallel an existing pipeline at the base of the existing Recapture Creek dam and US-191 road grade. Travelers on US-191 would not likely see the pipeline corridor as they crossed the dam because of the downward viewing angle and their travel speed. Rather, their attention would likely be focused on the strikingly deep blue-green water of Recapture Creek Reservoir and the rugged cliffs of the Burro Canyon Formation. After the pipeline was removed and the corridor revegetated, the corridor would not be visible. Construction of a slurry pipeline at this location would be compatible with BLM's Class II visual resource objectives.

Construction of the remainder of the pipeline route that would be visible to the general public would be expected to meet BLM's Class III and Class IV visual resource objectives. In these areas, the smooth, linear, unvegetated swath created by pipeline construction would contrast moderately with the surrounding landscapes (see Section 3.4.19.9). After the pipeline was removed and the corridor revegetated, the contrast between the corridor and surrounding landscape would be moderate to nonexistent, depending upon the success of revegetation. Figure 4–20 shows a photo simulation of the booster pump station area in Lisbon Valley after reclamation.

Figure 4–20. Simulated View of the Reclaimed Booster Pump Station Area in Lisbon Valley from Northbound Lane of US-191

4.4.11.4 Monitoring and Maintenance Impacts

Monitoring and maintenance activities under the White Mesa Mill off-site disposal alternative would have no impacts to visual resources.

4.4.11.5 Impacts from All Sources

Moving the uranium mill tailings pile from the Moab site to the White Mesa Mill site would have some moderate, short-term, adverse visual impacts and moderate to no long-term adverse visual impacts, primarily because the short-term construction activities and the completed disposal cell would not be seen by many people. At the Moab site, removal of the pile would have strong beneficial impacts to visual resources. Table 4–46 summarizes visual resource impacts expected under this alternative.

Table 4–46. Summary of Visual Resource Impacts Under the White Mesa Mill Off-Site Disposal Alternative

Location/Activity	Visual Resource Impacts	
	Short Term	Long Term
Moab site	Strong adverse impacts primarily to travelers on US-191 and SR-279	Strong positive impacts from removal of tailings pile
White Mesa Mill site	Minor adverse impacts from night lighting	Unknown impacts from night lighting
White Mesa borrow area	No adverse impacts	No adverse impacts
Blanding borrow area	Moderate adverse impacts to southbound US-191 travelers	No adverse impacts
Truck haul[a]	No adverse impacts	No adverse impacts
Slurry pipeline[a]	Overall, moderate adverse impacts to travelers on US-191	Overall, moderate to no adverse impacts to travelers on US-191
Monitoring and maintenance	No adverse impacts	No adverse impacts

[a]Only one transportation option would be selected.

4.4.12 Infrastructure

This section addresses potential impacts on the availability of electric power, potable water, nonpotable water, sewage treatment, and highways under the White Mesa Mill off-site disposal alternative. Unless indicated otherwise, all infrastructure impacts would be temporary and would last only as long as project construction and operations were ongoing.

4.4.12.1 Construction and Operations Impacts at the Moab Site

The infrastructure impacts associated with construction and operations at the Moab site would be the same as those described in Section 4.2.12.1 for the Klondike Flats site, with the exception of the electric power demand under the slurry pipeline option. Under that option, the power demands would be 6,100 kVA, 2,700 kVA more than for the Klondike Flats site. ESC Inc. developed and reviewed this projected demand with Mathew Yates, Pacific Corporation, Moab. Pacific Corporation indicated that this demand would present no capacity problems to the existing electric supply system at the site, nor would system upgrades be required (ESC 2003).

4.4.12.2 Construction and Operations Impacts at the White Mesa Mill Site

Qualitatively, the infrastructure impacts associated with construction and operations at the White Mesa Mill site would be the same as those described for the truck and pipeline options in Section 4.2.12.2 for the Klondike Flats site and in Section 4.3.12.2 for the Crescent Junction site, with the exception of electric power demands. The impact on the existing electrical infrastructure servicing the White Mesa Mill site would differ for the two alternative modes of transportation. For truck transportation, the total power demand at the White Mesa Mill site would be 300 kVA, which is the basic demand required for site construction and operations. The same basic demand would be required at the Klondike Flats or Crescent Junction sites. For slurry pipeline transportation, the demand would be 3,100 kVA, 600 kVA more than for the Klondike Flats site and 300 kVA more than for the Crescent Junction site. ESC of Fort Collins, Colorado, developed and reviewed this projected demand with Mathew Yates, Pacific Corporation, Moab. Pacific Corporation indicated that capacity of the existing distribution circuit would be adequate for the truck haul option. However, the slurry pipeline transport system would require the addition of a substation transformer at Utah Power's Blanding substation and a distribution upgrade from the substation to the White Mesa Mill site. In addition, the intermediate slurry pump booster station

facility would require (1) the addition of a substation transformer at Utah Power's La Sal substation, (2) a new 3-mile power line extension to the proposed site of a pump booster station, and (3) an upgrade of the existing line from the La Sal substation to its current end point (ESC 2003).

Quantitatively, potable and nonpotable water demands would be the same as those previously described for the Moab site in Section 4.2.12.1 and the other two off-site disposal sites in Sections 4.2.12.2 and 4.3.12.2. However, in contrast to the other sites, the sources of the water would not be the City of Moab (for potable water) or the Colorado River (for nonpotable water). The Entrada/Navajo aquifer is capable of yielding domestic quality water at rates of 150 to 225 gpm (216,000 to 324,000 gallons per day) and is used as a secondary source of potable water for the White Mesa Mill. IUC has constructed five deep water supply wells at the White Mesa Mill. The yield capabilities from these wells would be sufficient to meet the maximum demand for potable water from implementing the proposed action at the White Mesa Mill site—that is, 7,500 gallons per day for the truck transportation option. Nonpotable water would be drawn from the existing Recapture Reservoir, where IUC currently holds major water use rights.

Activities at the White Mesa Mill site would generate 5,000 to 11,000 gallons of sanitary waste per week, depending on the transportation mode. This volume would be in addition to the 10,000 gallons per week generated at the Moab site. Sanitary waste generated at the White Mesa Mill site would be disposed of in the on-site, State-approved leach field system or in the city of Blanding's sewage treatment plant. The White Mesa Mill currently disposes of all its sanitary waste in the leach field system. However, it is unknown whether this system has the capacity to manage the sanitary waste that would be generated by the additional workers required at the site. If necessary, the additional sanitary waste could be stored at the White Mesa Mill site in portable toilets and septic tanks and disposed of in the Blanding sewage treatment plant. The Blanding sewage treatment plant has the capacity to serve 5,000 people, but only 3,000 people currently dispose of sanitary waste at the plant. Consequently, there would be sufficient excess capacity to accommodate the additional workers at the site under either transportation mode. There are currently no restrictions for receiving concentrated sanitary waste of the type stored in septic tanks and portable toilets.

4.4.12.3 Construction and Operations Impacts Related to Transportation

For the truck transportation option, there would be no infrastructure impacts above the 300 kVA demand for site construction and operations. However, the slurry pipeline option would represent an additional demand of 2,800 kVA for the pipeline terminal station. The slurry pump booster station that would be required for pipeline operations represents a demand of 4,800 kVA; it would require the installation of a new substation transformer at the Utah Power La Sal substation, approximately 3 miles of new distribution line from the new substation to the proposed booster pump location, and an upgrade of the existing line from the La Sal substation to its current end point.

Impacts to the road infrastructure would be qualitatively similar to those described in Section 4.2.12.3.

4.4.12.4 Monitoring and Maintenance Impacts

Under the White Mesa Mill off-site disposal alternative, monitoring and maintenance activities would be generally limited to periodic inspections and activities to remedy incipient erosion, as necessary. DOE does not expect these activities to affect the local or regional infrastructures.

4.4.12.5 Impacts from All Sources

Regional and local supplies of power, water, and sewage treatment capacity would be adequate to meet the requirements of the White Mesa Mill off-site disposal alternative. Transportation would cause increased wear on roads, which would be paid for through vehicle registration and special permit fees.

4.4.13 Solid Waste Management

Waste management impacts would be the same as those described for the Klondike Flats site in Section 4.2.13, except that the estimated 1,040 yd^3/year of solid waste generated at the White Mesa Mill site would not be sent to a municipal or county landfill. Consistent with White Mesa Mill practice, all solid waste generated at the site would be disposed of in an existing or in the new tailings disposal cell. This additional annual waste volume amounts to a cube approximately 10 yards on a side and would be insignificant compared to the volume of the disposal cell.

4.4.14 Socioeconomics

The socioeconomic impacts from off-site disposal at the White Mesa Mill site would be similar in scope to those described in Sections 4.2.14 and 4.3.14. The aggregate expenditures under this alternative would cover construction and surface remediation at the Moab and White Mesa Mill sites, ground water remediation, remediation of vicinity properties, and transportation of materials from the Moab site and vicinity properties to the White Mesa Mill site. The project cost data and economic impact estimation methodology are described in Section 4.1.14.

The economic impacts of off-site disposal at the White Mesa Mill site are summarized in Table 4–47. Truck transport and slurry pipeline transport options are considered under the White Mesa Mill off-site disposal alternative. Over the 8-year disposal period, the annual project costs are estimated to be $52,522,525 under the truck transport option and $58,224,925 under the slurry pipeline transport option. In both cases, the 75-year ground water remediation/site monitoring phase of the project is estimated to cost $933,000 per year. The truck transport option would increase regional output of goods and services by $69,214,183 a year. Under the slurry pipeline option, the demand for goods and services would increase by $76,728,806. The new spending would also increase labor earnings and employment. Under the truck transport option, earnings and employment would rise by $17,069,821 and 598 direct and indirect jobs. Under the slurry pipeline option, the increase in labor earnings and employment would be $18,923,101 and 778 direct and indirect jobs during the first-year construction phase of the pipeline. Thereafter, earnings and employment would scale down to $15,336,642 and 320 direct and indirect jobs.

Table 4–47. Economic Impacts in the Two-County Socioeconomic Region of Influence Under the White Mesa Mill Off-Site Disposal Alternative

Transport Method	Annual Cost	Annual Output of Goods and Services	Annual Labor Earnings	Jobs
Truck	$52,522,525	$69,214,183	$17,069,821	598
Pipeline	$58,224,925	$76,728,806	Year 1 $18,923,101 Years 2–8 15,336,642	778 320

Note: Economic impacts for regional output of goods and services and labor earnings are calculated based on final-demand multipliers provided by the Bureau of Economic Analysis. The respective multiplier values (1.3178 and 0.3250) are multiplied by annualized cost to generate the impact values shown. Employment impacts are calculated as the product of the direct-effects multiplier (1.4262) and total direct jobs for each action alternative (see Tables 2−16, 2−17, and 2−18).

The potential shorter-term impacts under the White Mesa Mill off-site disposal alternative would include increased demand for temporary housing (discussed in Section 4.1.14) and transportation-related inconveniences to motorists (discussed in Section 4.4.16). The extent of these shorter-term impacts would depend on levels of tourism-recreation activities and the mode of transportation used in the remediation process. Longer-term beneficial impacts under the off-site disposal alternative would relate to greater opportunities for economic development in the Moab area and the communities of San Juan County and greater diversification of the tax base (discussed in Section 4.1.14).

4.4.15 Human Health

This section addresses potential impacts to human health under the White Mesa Mill off-site disposal alternative. These impacts are worker deaths that could occur as a result of industrial accidents and worker or public latent cancer fatalities that could occur as a result of exposure to radiation from activities at the Moab and White Mesa Mill sites, at vicinity properties, or during transportation of materials.

4.4.15.1 Construction and Operations at the Moab Site and the White Mesa Mill Site

Under the White Mesa Mill off-site disposal alternative, construction activities would occur at vicinity properties, borrow areas, White Mesa Mill, and the Moab site. Table 4–48 lists the impacts from these activities. For each option under this alternative, less than one fatality would be estimated to occur from construction activities.

Table 4–48. Construction-Related Fatalities for White Mesa Mill Disposal Alternative

Alternative	Construction Fatalities
Truck Option	
Vicinity properties	0.031
Borrow areas	0.042
Moab and White Mesa Mill activities	0.31
Total	**0.38**
Slurry Option	
Vicinity properties	0.031
Borrow areas	0.042
Moab and White Mesa Mill activities	0.47
Total	**0.54**

Workers. Under the White Mesa Mill off-site disposal alternative, workers would be exposed to radon gas (an inhalation hazard) and external radiation from the mill tailings at the Moab site, vicinity properties, and at White Mesa Mill. Monitoring data collected during construction of an evaporation pond on the tailings pile at the Moab site indicate that the highest radon level measured on the pile was 0.096 working levels (21 pCi/L). A worker exposed to this level of radon for 2,000 hours per year would have a latent cancer fatality risk of 6.1×10^{-4} per year of exposure. The highest gamma exposure rate measured on the mill tailings pile was about 0.60 mR/h. A worker exposed to this level of radiation for 2,000 hours per year would have a latent cancer fatality risk of 6.0×10^{-4} per year of exposure. The total latent cancer fatality risk to the worker on the mill tailings pile would be 1.2×10^{-3} per year of exposure (Table 4–49) or 6.0×10^{-3} over the 5-year duration of activities at the Moab site. Assuming that the radon and external radiation levels were comparable at White Mesa Mill, this would also be the latent fatality risk at the White Mesa Mill site.

Table 4–49. Worker Impacts Under the White Mesa Mill Off-Site Disposal Alternative

Worker	Site	Radon Related LCFs[a,b]	External Radiation Related LCFs[a,b]	Total LCFs[a,b]
Annual				
Individual	Moab	6.1×10^{-4}	6.0×10^{-4}	1.2×10^{-3}
	White Mesa Mill	6.1×10^{-4}	6.0×10^{-4}	1.2×10^{-3}
	Vicinity properties	2.9×10^{-4}	1.2×10^{-4}	4.1×10^{-4}
Population	Moab	0.041	0.040	0.081
	White Mesa Mill	0.043	0.042	0.085
	Vicinity properties	6.7×10^{-3}	2.9×10^{-3}	9.6×10^{-3}
	Total	**0.091**	**0.085**	**0.18**
5-Year Duration of Activities				
Individual	Moab	3.0×10^{-3}	3.0×10^{-3}	6.0×10^{-3}
	White Mesa Mill	3.0×10^{-3}	3.0×10^{-3}	6.0×10^{-3}
	Vicinity properties	8.7×10^{-4}	3.7×10^{-4}	1.2×10^{-3}
Population	Moab	0.20	0.20	0.40
	White Mesa Mill	0.21	0.21	0.42
	Vicinity properties	0.020	8.6×10^{-3}	0.029
	Total	**0.43**	**0.42**	**0.85**

[a]Based on 67 workers at the Moab site, 70 workers at the White Mesa Mill site, and 23 workers at vicinity property sites.
[b]LCF = latent cancer fatality.

The Moab site would employ about 67 workers. If they were all exposed to radon and external radiation at the levels discussed for individual workers, the latent cancer fatality risk for this population of workers would be 0.081 per year of exposure, or 0.40 over the 5-year duration of activities at the Moab site. The White Mesa Mill site would employ about 70 workers. If they were all exposed to radon and external radiation at the levels discussed for individual workers, the latent cancer fatality risk for this population of workers would be 0.085 per year of exposure, or 0.42 over the 5-year duration of activities at White Mesa Mill.

Impacts to workers as a result of activities at the vicinity properties would be the same as those under the on-site disposal alternative, as would be the lack of impacts from ground water treatment; these impacts are described in Section 4.1.15.2.

Under the White Mesa Mill off-site disposal alternative, nearby residents would be exposed to radon gas released at the Moab site and at the White Mesa Mill site. The average radium-226 content of the tailings, 516 pCi/g, would produce a latent cancer fatality risk for a nearby resident

in Moab of 8.8×10^{-3} over the 5-year duration of activities at the Moab site and 7.8×10^{-6} over the 5-year duration of activities at the White Mesa Mill site. These estimates include radon released from the drying areas at Moab. If a slurry pipeline were used to move the tailings to the White Mesa Mill site, the drying areas would not be necessary, and the resulting latent cancer fatality risk for a nearby resident at Moab would be reduced to 6.9×10^{-3} over the 5-year duration of activities at Moab.

For the population, over the 5 years of activities at White Mesa Mill, the latent cancer fatality risk to the population surrounding the White Mesa Mill site would be 0.012. Over the 5 years of activities at the Moab site, the latent cancer fatality risk to the population surrounding the Moab site would be 1.0. If a slurry pipeline were used to move the tailings to White Mesa Mill, the drying areas would not be necessary, and the resulting latent cancer fatality risk for the population surrounding the Moab site would be reduced to 0.74 over the 5-year duration of activities at the Moab site.

Nearby residents would also be exposed to radioactive particulates (e.g., radium-226, polonium-210, thorium-230, and uranium) windblown from the Moab site and from the White Mesa Mill site. Estimates based on monitoring data collected during 1998 and 1999 from the Monticello mill tailings site when uranium mill tailings were being excavated indicate that the latent cancer fatality risk from radioactive particulates would be about 0.1 percent of the risk from radon emissions from the Moab site and the White Mesa Mill site. This is due to the aggressive dust suppression practices that would be used to minimize emissions of radioactive particulates.

4.4.15.2 Construction and Operations Impacts Relating to Transportation

Under the White Mesa Mill off-site disposal alternative, there would be a total of 292,888 shipments if trucks were used to move the tailings (Table 4–50). If a slurry pipeline were used to move the tailings, there would be 26,276 shipments. These shipments would include contaminated material from vicinity properties, uranium mill tailings, and borrow material, which would consist of cover soils, radon and infiltration barrier soils, sand and gravel, riprap, and Moab site reclamation soils.

Table 4–50. Shipments Under the White Mesa Mill Off-Site Disposal Alternative

Material	Truck Option		Slurry Pipeline Option	
	Shipments	Mode	Shipments	Mode
Vicinity property material	2,940	Truck	2,940	Truck
Borrow material	21,148	Truck	21,148	Truck
Uranium mill tailings	268,800	Truck	2,188	Truck
Total	**292,888**		**26,276**	

The transportation impacts of shipping contaminated materials from vicinity properties, mill tailings, and borrow material would be from two sources: radiological impacts and nonradiological impacts. Radiological impacts would be from incident-free transportation and from transportation accidents that released contaminated material. There would be no radiological impacts from moving borrow material because it is not contaminated. Nonradiological impacts would be from engine pollutants (emissions from the truck moving the contaminated materials from vicinity properties, the mill tailings, and the borrow material), and

from traffic fatalities. The total transportation impacts would be the sum of the radiological and nonradiological impacts. Additional details on these analyses are provided in Appendix H.

Table 4–51 lists the transportation impacts under the White Mesa Mill off-site disposal alternative. For this alternative, there would about one fatality if trucks were used to move the tailings. If a slurry pipeline were used, there would less than one fatality. In comparison, about 40,000 traffic fatalities occur annually in the United States (U.S. Census Bureau 2000).

Table 4–51. Transportation Impacts Under the White Mesa Mill Off-Site Disposal Alternative

Alternative	Radiological			Nonradiological		Total Fatalities
	Incident-Free		Accident Risk LCFs	Pollution Health Effects Fatalities	Traffic Fatalities	
	Public LCFs	Worker LCFs				
Truck Option						
Vicinity properties	2.7×10^{-5}	3.9×10^{-5}	6.9×10^{-9}	3.7×10^{-4}	1.1×10^{-3}	1.5×10^{-3}
Borrow material	0	0	0	1.2×10^{-3}	0.053	0.054
Mill tailings	0.026	0.049	1.4×10^{-6}	0.067	1.2	1.3
Total	**0.026**	**0.049**	**1.4×10^{-6}**	**0.069**	**1.3**	**1.4**
Slurry Option						
Vicinity properties	2.7×10^{-5}	3.9×10^{-5}	6.9×10^{-9}	3.7×10^{-4}	1.1×10^{-3}	1.5×10^{-3}
Borrow material	0	0	0	1.2×10^{-3}	0.053	0.054
Mill tailings	2.1×10^{-4}	4.0×10^{-4}	1.1×10^{-8}	5.4×10^{-4}	9.6×10^{-3}	0.011
Total	**2.4×10^{-4}**	**4.4×10^{-4}**	**1.8×10^{-8}**	**2.1×10^{-3}**	**0.064**	**0.067**

LCF = latent cancer fatality

Workers. For truck shipments of mill tailings from the Moab site to White Mesa Mill, the maximally exposed transportation worker would be the truck driver. This person was assumed to drive the truck containing mill tailings for 1,000 hours per year. For the other 1,000 hours per year, the truck would be empty. This driver would receive a radiation dose of 220 mrem/yr, which is equivalent to a probability of a latent cancer fatality of about 1.1×10^{-4}.

Public. For truck shipments of mill tailings from the Moab site to White Mesa Mill, the maximally exposed member of the public would be a resident who lived along the road on which the tailings were shipped. This person would receive a radiation dose of 1.0 mrem/yr, which is equivalent to a probability of a latent cancer fatality of about 6.3×10^{-7}.

Accidents. If trucks were used to transport the mill tailings from the Moab site to White Mesa Mill, the maximally exposed individual would receive a radiation dose of 0.16 mrem, or 1.6×10^{-4} rem from the maximum dose reasonably foreseeable for a transportation accident involving a shipment of mill tailings. This is equivalent to a probability of a latent cancer fatality of about 9.6×10^{-8}. The probability of this accident is about 0.3 per year.

If this accident occurred near Moab, Monticello, or Blanding, the population would receive a collective radiation dose of 1.8×10^{-3} person-rem, which is equivalent to a probability of a latent cancer fatality of about 1.1×10^{-6}. If this accident occurred in a rural area, the population would receive a collective radiation dose of 2.9×10^{-6} person-rem, which is equivalent to a probability of a latent cancer fatality of about 1.7×10^{-9}.

4.4.15.3 Monitoring and Maintenance

Monitoring and maintenance activities would include checking water quality and installing a long-term ground water remediation system at the Moab site, and conducting periodic maintenance and inspections of the White Mesa Mill site (checking for erosion, damaged fencing, etc.). None of these activities would be expected to breach the cap over the tailings. Installation of the ground water remediation system at the Moab site would be done in clean areas after remediation was complete. Data from another UMTRCA site indicate that the White Mesa Mill off-site disposal alternative would be effective in isolating the contaminants in the tailings from individuals conducting activities on the site. DOE (2001) concluded that both radon and gamma levels associated with the capped-in-place tailings pile at the Shiprock site in New Mexico were indistinguishable from naturally occurring radiation levels. Therefore, the latent cancer fatality risk to workers conducting monitoring and maintenance would be comparable to the risk from background levels of radioactivity in Utah, about 3×10^{-4} per year of exposure.

4.4.15.4 Impacts from All Sources

Under the White Mesa Mill off-site disposal alternative, less than one fatality would be estimated to occur from construction activities under either transportation option. Transportation of contaminated materials from the Moab site to the White Mesa Mill site would result in the exposure of workers and the public to very small amounts of radiation; these exposures would not be expected to result in any latent cancer fatalities to any population. Ammonia releases from ground water remediation would be well below threshold concentrations for human health effects.

Based on as-built radon flux measurements from completed uranium mill tailings disposal cells constructed under both Title I (federal UMTRA sites) and Title II (private licensees) of UMTRCA, it is anticipated that actual radon flux would be two orders of magnitude less than the 20-pCi/m^2-s EPA protective standard promulgated in 40 CFR 192. However, even though DOE's experience supports a conclusion that radon release rates from the capped pile would be negligible and that DOE's long-term monitoring and maintenance of the site would ensure cap integrity, for the purpose of supporting analyses of long-term performance and impacts, DOE has also assessed impacts assuming the maximum allowable release rate of radon, 20 pCi/m^2-s, under EPA's regulations (40 CFR 192).

On the basis of this emission rate and the dimensions of the disposal cell, the latent cancer fatality risk for a nearby resident would be 6.4×10^{-8} per year of exposure, or 1.9×10^{-6} over the 30-year period following the end of construction and operations. This latent cancer fatality risk is less than the risk from background levels of radioactivity in Utah, about 3×10^{-4} per year of exposure.

For the population near the White Mesa Mill site, the latent cancer fatality risk would be 3.0×10^{-3} over the 30-year period following the end of construction and operations.

At the Moab site, radon emissions would fall to background levels because the mill tailings pile would have been relocated. The latent cancer fatality risk would be comparable to the risk from background levels of radioactivity in Utah, about 3×10^{-4} per year of exposure.

The design life of the disposal cell for the uranium mill tailings is 200 to 1,000 years. Over this period of time, the amount of radioactivity in the disposal cell will decrease slightly, less than 1 percent, due to the half lives of the radionuclides contained in the uranium mill tailings. In the time frame of 200 to 1,000 years, the major route of exposure of people is likely to be inhalation of radon progeny from the disposal cell. A person could drill a well into the shallow aquifer near the White Mesa Mill site, but it is more likely that this person would use the surface water at Ruin Spring, located about 10,000 ft from the disposal cell. The travel time for contaminants from the disposal cell to the spring is in the range of 3,570 to 7,690 years, so it is unlikely that the water at Ruin Spring would contribute large latent cancer fatality risks relative to inhalation of radon progeny. With the disposal cell cover in place and the White Mesa Mill site being under perpetual care, it is likely that the latent cancer fatality risk for an inadvertent intruder would also be low.

After the disposal cell cover was installed, the estimated annual latent cancer fatality risk from radon for a nearby White Mesa resident would be 6.4×10^{-8}. As with the radioactivity in the disposal cell, the annual risk would also not decrease appreciably over the 200- to 1,000-year time frame. Therefore, the annual latent cancer fatality risk for a nearby White Mesa resident would be about the same immediately after the cover was installed as it would be 1,000 years after the cover was installed. This assumes that the nearby resident remains at his or her present location. If the resident were to move closer to the disposal cell, the annual latent cancer fatality risk would be similar to the risk at the Moab site, 8.9×10^{-5} per year of exposure.

Based on the 20 pCi/m^2-s radon release rate, for the population within a 50-mile radius of the White Mesa Mill site, the annual latent cancer fatality risk was estimated to be 9.9×10^{-5}. As with the radioactivity in the disposal cell, the annual risk would also not decrease appreciably over the 200- to 1,000-year time frame. If it is assumed that the population around the White Mesa Mill site remains constant over 1,000 years, then the estimated latent cancer fatality risk over the 1,000-year time period would be 0.1.

4.4.16 Traffic

This section summarizes potential impacts to traffic in the area affected under the White Mesa Mill off-site disposal alternative. In the following discussions, estimated percent increases in traffic are based on increases over the 2001 AADT for all vehicles or for trucks on segments of US-191 (see Table 3–15). Implementation of this alternative would increase area traffic because of construction and operations at the Moab site, remediation of vicinity properties, transport of tailings from the Moab site to the White Mesa Mill site, and transport of borrow materials from borrow areas to the Moab site, vicinity properties, and the White Mesa Mill site.

There would be initial minor short-term (period of several months) increases in area traffic on US-191 while various preparations took place at the Moab site and at the White Mesa Mill site. These activities would include bringing heavy construction equipment, such as backhoes, graders, front-end loaders, bulldozers, and trucks, to those sites; and constructing secure stockpile areas for various materials to be used during the remedial action (e.g., diesel fuel, water for dust control). In addition, a variety of construction trades would need to access the sites to set up temporary field offices and prepare road access areas. These activities would add to area traffic and could result in minor congestion and inconveniences near the site entrances on US-191.

Construction workers would commute to the Moab site for jobs at the site, at vicinity properties, and at borrow areas. DOE estimates that the average annual vehicle trips associated with 190 workers could increase daily traffic in central Moab by 380 vehicle trips per day on US-191 (truck transportation mode). Transportation-related workers would also commute to jobs. An additional 458 vehicle trips per day on US-191 would be attributed to the 229 transportation-related workers. It is likely that one-half or more of these workers (minimum of 115 workers) would live in towns south of Moab, such as Monticello, Blanding, or White Mesa, and would not affect travel patterns in Moab. However, if all workers commuted through central Moab, it would increase traffic there by 5 percent. (The pipeline transportation mode could increase traffic in downtown Moab by 3 percent). The current traffic situation in Moab is reported by UDOT as highly congested, and these additional vehicle trips would exacerbate the current congestion problem. Miscellaneous trips for supplies and meals would also add to traffic congestion. It is expected that some workers would car-pool, which would reduce travel impacts. In addition, assuming a double work shift, approximately half of these trips would occur before 7:00 a.m. and just after 4:00 a.m., times of the day when traffic volumes are typically lower. The impact associated with the 502 pipeline construction workers was not considered a worst-case scenario due to the relatively short time frame (9 months) and transient nature of the construction. A double work shift would involve the first shift arriving before 7:00 a.m. and leaving just after 5:30 p.m. The second shift would arrive just before 5:30 p.m. and leave just after 4:00 a.m.

Transporting contaminated vicinity property material to the Moab site and transporting clean backfill material to the vicinity properties would require up to 48 daily truck trips on local roads and US-191. Some or most of these trips would transit central Moab (Section 2.1.2.2). Assuming the worst-case traffic scenario of a double work shift, transporting all contaminated material from the Moab site to the White Mesa Mill site would require an estimated 768 daily tandem truck trips (calculcated from Table 2–9) on US-191, all of which would transit central Moab. UDOT reports the 2001 average annual daily truck traffic through central Moab as 4 percent of the total vehicle count, or 642 trucks. Truck traffic related to hauling materials (tailings and vicinity property material) through central Moab would result in a 127-percent increase in downtown truck traffic, from 642 trucks to an estimated 1,458. Although this increase would be distributed evenly over the 20 hours per day that work was ongoing under a double-shift work schedule, it would be an extreme impact to the already congested central Moab area, particularly during the peak tourist season when daily vehicle counts are highest.

For the segments of US-191 from south of central Moab to the White Mesa Mill site, the truck traffic on US-191 constitutes between 7 and 14 percent of the total vehicle traffic, or between approximately 370 to 1,190 trucks per day, depending on the segment of US-191. Adding 768 tandem trucks per day would increase truck traffic between 65 and 186 percent, depending on the segment. Although the percent change would be high, for most of the route between Moab and the White Mesa Mill site, the average daily traffic counts and truck use are low, and UDOT does not report any of the route as congested.

A slurry pipeline would also require limited transport of materials by truck. Transport of oversized materials that could not be transported by pipeline would result in additional minor use of trucks on US-191 (about six truck trips per day). In addition, borrow materials would be transported as described under the truck transportation option above.

Annual monitoring and maintenance activities at the site would result in no increases in traffic volumes.

4.4.17 Disposal Cell Failure from Natural Phenomena

It is possible that a disposal cell failure could occur at the White Mesa Mill site. The possibility of failure at this site would be much lower than at the Moab site because it was selected for analysis, in part, to avoid the more dynamic characteristics of the Moab site (see Chapter 3.0). The White Mesa Mill site is not located near a river, does not have historical seismic activity, and is not prone to settling. In addition, this site is located farther away from populated areas or sensitive habitats than the Moab site, which would reduce the potential risks if a disposal cell failure occurred. Therefore, the possibility of a failure occurring and resulting in potential risks at the White Mesa Mill site would be much lower than the potential risks of a disposal cell failure at the Moab site. For this reason, potential failure at this site was not evaluated.

4.4.18 Environmental Justice

The basis for DOE's analysis of environmental justice impacts is described in Section 4.1.18. The area approximately 20 miles south of the White Mesa Mill site has a large segment in which the minority population is greater than 50 percent. The White Mesa Ute Reservation is adjacent to the White Mesa Mill site, and the Navajo Reservation occupies a significant portion (28 percent) of San Juan County, where the White Mesa Mill site is located. Reported household incomes of less than $18,244 (poverty level for a family of four) per year are found in census group blocks within about one-half of the populated areas south of the site. The lowest income block group is about 15 miles from the site. Although these populations could be exposed to small doses of radiation as a result of activities under this alternative, there is no evidence that they would be exposed at a level any higher than the general population.

To address potential exposure pathways that could be unique to members of the low-income or minority populations using the area around the White Mesa Mill, two additional human health analyses have been generated for (1) an individual consuming water from Ruin Springs and (2) an individual consuming deer meat from a deer that inhabited the vicinity of the White Mesa Mill site**.**

Impacts at Ruin Spring. Impacts were estimated for an individual who occupied the area in the vicinity of the Ruin Spring site, which is located about 2 miles south-southwest of the White Mesa Mill operating facilities and disposal cells. This individual was assumed to occupy the Ruin Spring site for 1 day per week or 1,248 hours per year. The individual was also assumed to breathe air containing radon and radon progeny released from the White Mesa Mill and to drink water from Ruin Spring. The drinking water consumption rate was estimated to be 2 liters per day. Impacts from drinking water consumption were estimated using radionuclide concentrations measured in 2003 at Ruin Spring. The latent cancer fatality risk for this individual was estimated to be 1.5×10^{-5} per year of exposure, or 7.4×10^{-5} over the 5 years of activities at the White Mesa Mill site.

Impacts from Subsistence Consumption of Deer Meat. Mule deer (*Odocoileus hemionus*) graze in the vicinity of the White Mesa Mill site and are harvested by local residents. Environmental data collected from 1998 through 2002 for radionuclide concentrations in forage and soil and radionuclide concentrations in water measured in 2003 were used to estimate impacts for an individual who obtained 100 percent of this meat from mule deer that graze in the vicinity of the White Mesa Mill site. This analysis assumed that the mule deer obtained 100 percent of its food and water near the White Mesa Mill site. The latent cancer fatality risk for this individual was

estimated to be 4.7×10^{-8} per year, or 2.3×10^{-7} over the 5 years of activities at the White Mesa Mill site.

The risks calculated under these two unique exposure pathways would be less than those predicted for the members of the general population in Section 4.4.15.1 for the disposal of the Moab site mill tailings at the White Mesa Mill site.

Disproportionate adverse impacts to minority and low-income populations would occur under this alternative as a result of unavoidable adverse impacts on potential traditional cultural properties located on and near the White Mesa Mill site, the proposed White Mesa Mill pipeline route, White Mesa Mill borrow area, and Blanding borrow area (see Sections 4.4.9 and 4.5). At least 11 potential traditional cultural properties would be unavoidably and adversely affected. If this alternative were implemented, the likelihood that additional traditional cultural properties would be located (once cultural studies were completed) is extremely high. These sacred, religious, and/or ceremonial sites are associated with the Ute, Navajo, and Hopi cultures and peoples.

4.5 Borrow Areas

Impacts at borrow areas are discussed here as a separate, stand-alone topic in response to a request by BLM, one of the cooperating agencies. BLM indicated that analyzing impacts to borrow areas as a stand-alone topic would facilitate the subsequent analyses necessary to authorize DOE to use borrow material at BLM-managed borrow areas.

DOE assessed the potential impacts of removing borrow materials from 10 borrow areas (Crescent Junction, Floy Wash, Courthouse Syncline, Klondike Flats, Tenmile, Blue Hills Road, LeGrand Johnson, Papoose Quarry, Blanding, and White Mesa Mill). Figure 2−8 shows the locations of the 10 borrow areas analyzed.

As shown in Table 4–52, the impacts of removing materials from the proposed borrow areas would be similar among all the sites. Four of the sites (Floy Wash, LeGrand Johnson, Papoose Quarry, and Blanding) are existing borrow areas. Five other sites are on land managed by BLM (Crescent Junction, Courthouse Syncline, Klondike Flats, Tenmile, and Blanding) and would require the issuance of a borrow area permit by BLM. The acreages identified in Table 4–52 for BLM-managed borrow areas have been segregated for DOE's use.

Construction or upgrading of roads necessary to transport materials from borrow areas to vicinity properties or the Moab site may affect floodplains and wetlands, if present.

Short-term land use impacts would occur on borrow sites providing materials for construction. All borrow sites except those associated with the White Mesa Mill site are within grazing allotments for BLM and, grazing rights could be temporarily vacated. The borrow sites would be reclaimed, and the acreage would be available for any uses designated prior to mineral extraction. There would be no land use impacts from materials procured from commercial operations.